PRESENTATION OF THE ACADEMY MEDAL TO REBECCA C. LANCEFIELD, PH. D.

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NEXT year will mark the 100th anniversary of the first description of streptococci as disease-producing agents. It was in 1874 that Billroth published his treatise on the occurrence of chains of microorganisms in erysipelas and wound infections. During the intervening century the ubiquity of these organisms and the breadth of their pathogenic potential gradually became evident, and hemolytic streptococci are today among the best studied and most intimately known of medically important bacteria. In awarding its 1973 Academy Medal to Rebecca C. Lancefield, the New York Academy of Medicine is honoring the scientist most responsible for the well-organized state of our present knowledge of streptococci. Her contributions form the structure on which all the recent advances in this field rest.

In one sense, these contributions are widely recognized. Throughout the world, her name is well known to microbiologists and to physicians, especially those who retain an interest in infectious disease, for her definition of the Lancefield groups and types of streptococci. As is often the case, the renown resulting from this eponymic association understates her contributions and is misleading concerning their true nature. It tends to emphasize the systematic aspects of her classification of streptococci while neglecting the biological studies that led to its development. As important an achievement as is the serological classification of streptococci, it grew out of basic work on the biology of the organism that has much broader implication in medical science.

Dr. Lancefield had her first introduction to the streptococcus when, as a graduate student, she joined O. T. Avery and A. R. Dochez at the Rockefeller Institute in studies of strains isolated from a severe

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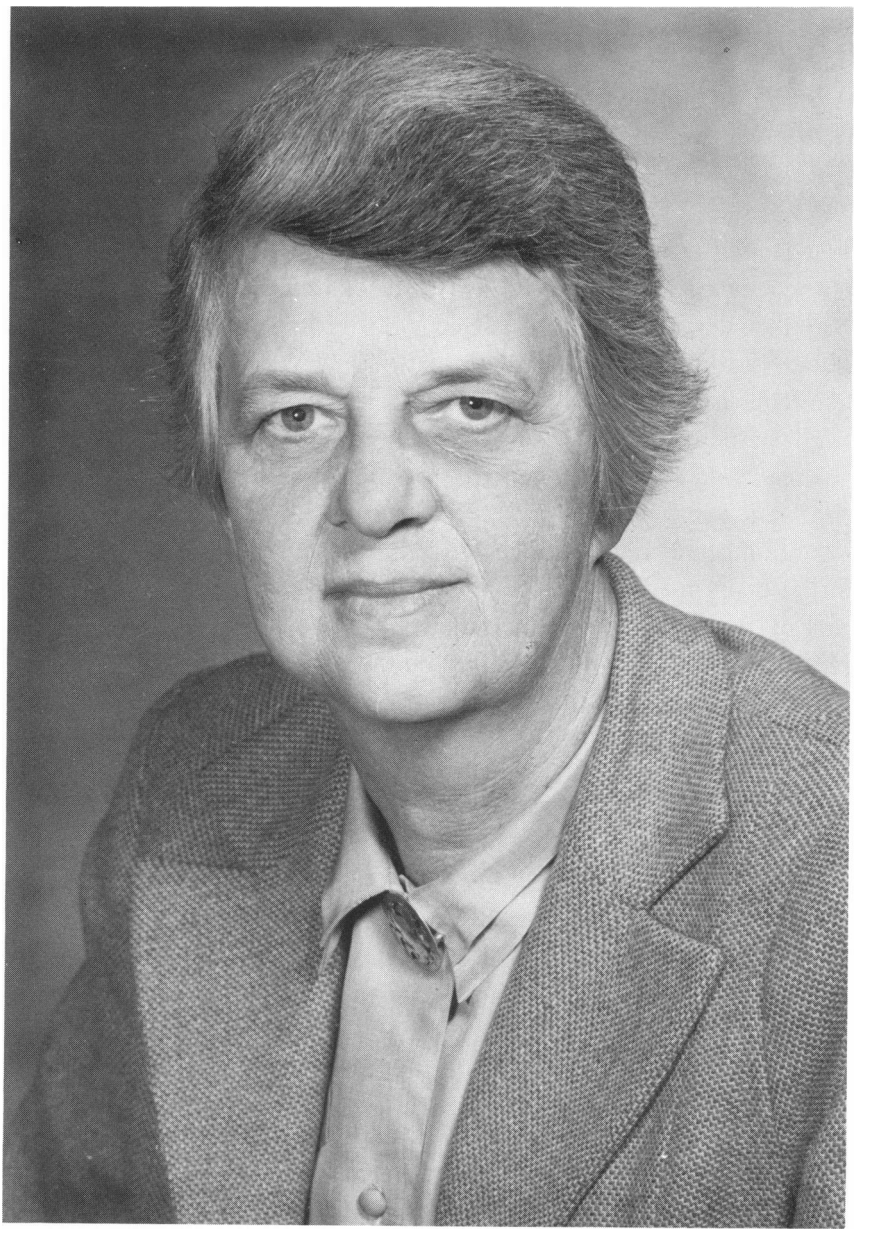
epidemic in military camps during World War I. This study resulted in the demonstration of serological differences between several of the epidemic strains and was the initial step in a series of investigations that culminated some years later in her discovery of the type-specific M antigen of group A streptococci. It is important to remember that her work with this antigen occurred at a time when capsular polysaccharide antigens were the focus of attention as type-specific substances and determinants of bacterial virulence, as a result of the studies of pneumococci and several other pathogens. With this background and in a setting in which the polysaccharide story had developed, Dr. Lancefield persisted in her studies demonstrating that the M antigen is a protein and that it has the same relation to virulence as the pneumococcal capsule: i.e., that it is able to prevent ingestion and destruction of streptococci by host phagocytes.

This development is but one theme in the broad sweep of her investigations of these bacteria. Streptococci comprise an extraordinarily diverse group of organisms, and separation into distinct categories by conventional methods was not particularly successful. On this fact rests the great importance of Dr. Lancefield's demonstration that streptococci isolated from various sources in nature can be divided into several distinct serological groups on the basis of precipitin reactions with carbohydrate like antigens extracted from the organism. There was a high degree of correlation between serological groups and the natural habitat in which the streptococci were found, and from this emerged the finding that the common streptococcal infections in man are largely referable to a single group—designated group A. Thus, the agents of streptococcal sore throat, scarlet fever, and erisypelas, as well as the antecedent infections leading to acute rheumatic fever and acute glomerulonephritis, are all group A streptococci. Dr. Lancefield showed that there are many different serological types of group A streptococci, based on the occurrence of different serological type-specific M proteins and that immunity to streptococcal infection is type-specific and dependent on the opsonizing action of anti-M antibodies.

These facts about group A streptococci form the basis for our understanding of the natural history of streptococcal disease. The repetitive nature of the common streptococcal sore throat is readily explicable in light of these findings. Similarly, they serve to explain the recurrent nature of rheumatic fever as a sequela of streptococcal infection. The sero-



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logical differentiation streptococci and the underlying biological principles are the framework for all present studies of the epidemiology and pathogenesis of streptococcal disease. They have led, for example, to recognition that a limited number of nephritogenic types are involved in acute glomerulonephritis, thus sharpening the focus of the investigations of pathogenesis of this disease.

This brief description of Dr. Lancefield's work has of necessity touched upon only the highlights of certain aspects of her research on streptococci; her initial period at the Rockefeller Institute, to which I referred earlier, lasted only for one year. However, after finishing her graduate studies at Columbia University, Dr. Lancefield returned to Rockefeller for her long, sustained attack on the streptococcus. Although she became emeritus in 1965, I am happy to say that this has not influenced her continuing activity in the laboratory. She is presently revisiting the group B streptococcus, her earlier work on this organism being among the many studies that I have neglected to mention. In addition to its medical importance, particularly in septicemia and meningitis of the newborn, the group B streptococcus has interesting biological properties and appears to combine protective polysaccharide and protein antigens in a single organism.

Dr. Lancefield's devotion to experimental work led her to resist some of the extracurricular activities to which the successful scientist is susceptible. However, she has by no means escaped completely, nor has she avoided the responsibilities imposed by her specialized knowledge. For example, she served as president of the Society of American Bacteriologists in 1943-1944 and of the American Association of Immunologists in 1961-1962. She was a member of the Commission on Streptococcal Diseases of the Armed Forces Epidemiological Board from its early existence until its recent demise.

Dr. Lancefield is a member of the National Academy of Sciences, an honor indicative of the broader recognition that her work has received. She was the recipient of the T. Duckett Jones Memorial Award of the Helen Hay Whitney Foundation in 1960 and the Research Achievement Award of the American Heart Association in 1964.

Dr. Lancefield is not enthusiastic about delivering lectures, and she has been known to resist successfully assignments of this kind. Although selective in this regard, she has given some notable memorial lectures honoring colleagues in the field of streptococcal biology: the Second

Griffith Memorial Lecture, delivered before the Society of General Microbiology in England in 1968, and the first Armine T. Wilson Memorial Oration delivered in Wilmington in the same year. Her Harvey Lecture, which happens to be the first of this distinguished series that I attended after coming to New York, was delivered in this auditorium in 1941 and remains a classic review of the development of her work up to that point. The title of that lecture reflects in a few words the nature of her approach to the problem: "Specific Relationship of Cell Composition to Biological Activity of Hemolytic Streptococci."

Dr. Lancefield's career is an impressive illustration of the fruits of persistent and systematic investigation in depth of the biology of a pathogenic microorganism. It has been my privilege to be closely associated with her during the second half of that career, and thus it is a special pleasure to participate in this presentation of the Academy Medal.